land bibliography and cartography, which have been compiled with much care, will be found very useful at the present time, but it is to be regretted, perhaps, that a map of the country was not added. The geographical notes include accounts of M. Oshanin's further explorations in the Pamir, and of the Loochoo Islands. There is also an obituary notice of M. Nicholas de Khanikoff.

THE Archbishop of Algiers has received a detailed journal of the experiences of the French missionary expedition on its way to Albert and Victoria Nyanza, and Lake Tanganyika, which he has promised to communicate shortly to *Les Missions Catholiques*. When published in that periodical, it will be accompanied by a map of Equatorial Africa, prepared from original sources of information by Père Charmetant, under whose auspices the expedition started from the east coast.

AT the last meeting of the Society of Commercial Geography at Paris, M. Reclus communicated his report on the exploration of the Isthmus of Darien, conducted under the orders of Lieut. Wyse.

IN the *Bulletin* of the Lyons Geographical Society, which has just been issued, M. Luciano Cordeiro, the learned Secretary of the Lisbon Geographical Society, contributes a second instalment of his papers on the first explorations of Central Africa, and the Portuguese doctrine of African hydrography in the sixteenth century.

NEWS has lately been received by the German African Society from Dr. Buchner, a traveller recently sent out to West Africa. He proposed to leave Loanda towards the end of December for Dondo, on the Quanza, where Major Mechow is delayed by illness.

THE just received *Boletin* of the Madrid Geographical Society for October last contains a lecture by D. Francisco de Paula Arrelaga, on the physical geography of the sea. Also papers on Afghanistan, on Bulgaria, and other eastern countries by Sr. D. Saturnino Giménez, and an account of a journey to Morocco in 1800 by a Spanish Commission.

THE enterprise of Mr. James Gordon Bennett in preparing two vessels for arctic exploration, the one to proceed by way of Spitzbergen and the other by Behring Straits, is already well known to our readers. The steamer *Jeannette* has been assigned to the Behring Straits' service, and is, we understand, already in San Francisco. A bill has been introduced into Congress by Mr. Wood authorising the Secretary of the Navy to accept this vessel and take charge of her. The bill provides that it is to be fitted up with any material on hand, and authority is given to enlist the necessary crew and to provide the naval officers; and the expense, at least the pay of the men, will be subsequently refunded by Mr. Bennett. It is not improbable that this vessel will be made useful in the search for and relief of the *Vega*, Prof. Nordenskjöld's steamer.

NOTES

WE announce with the greatest regret the sad news, just received by telegraph, of the death of Prof. W. K. Clifford at Madeira. We can do no more this week than barely announce this national loss.

THE Emperor of Austria has bestowed upon Dr. Meyer, the director of the Royal Zoological Museum of Dresden, the well-known New Guinea traveller, the order of the Iron Crown.

THE death is announced at Berlin of the well-known chemist, Prof. Sonnenschein. He had reached the age of sixty-two.

THE Council of the Society of Arts have appointed Mr. H. Trueman Wood, Secretary, in the place of the late Mr. P. Le Neve Foster.

ACCORDING to the *Kreuz Zeitung*, Prof. Virchow intends, on the close of the current semester, to accept an invitation of Dr. Schliemann to join him in some excavations at Troy.

THE Italian Ministry of Agriculture, Industry, and Commerce offers a reward of 3,000 lire to the author of the most complete and best monographic essay on the structure, the vital functions, and the diseases of the acid fruits, or species and varieties of the genus *Citrus* and kindred genera, provided that the said work, by a sufficient collection of original observations and experiments, should succeed in furnishing an important addition to the present knowledge concerning such subjects, and thereby supply a scientific criterion for the improvement of the cultivation of these acid fruits and for the cure of their diseases. The date for sending in the works competing for the said prize is fixed for the end of May, 1881. Essays by Italians, or by foreigners written in Italian, are admissible to the competition; but if written in another language they must be accompanied by an Italian translation. The essays sent in for competition are to be sent to the Ministry of Agriculture, Industry, and Commerce, with the superscription, "Competition for the Prizes for the best Essay on the genus *Citrus*," and they must be distinguished by a motto, to be given also in a sealed cover containing the name and address of the author.

IT is intended to make a special effort to issue the Report of the Sheffield Meeting of the British Association at an early date after the meeting. To enable this to be done the Council request that all Reports and Abstracts of all Papers intended to be read in the Sections, may be sent to the Assistant-Secretary not later than July 15, in order that, if approved of by the Organising Committees, they may be put in type before the Meeting. Authors who comply with this request, and whose Papers are accepted, will be furnished *before* the Meeting with printed copies of their Reports or Abstracts. No Report, Paper, or Abstract can be inserted in the volume unless it is in the Assistant Secretary's hands *before the conclusion of the Meeting*.

DR. BOTTOMLEY has called the attention of the Manchester Literary and Philosophical Society to an interesting copy of the "Principia" of Newton. In addition to being an impression of the first edition, it contains the autograph of Edmund Halley. It was a present from Halley to the Abbot Nazari. Nazari was the editor of a scientific journal at Rome from 1668 to 1681. The following is the entry in Halley's hand-writing:—

Illustrissimo Dno
Dro Abbati Nazario
Romæ humillime offert
Edm. Halley.

Subsequently the book was in the possession of Dr. Dalton, and its value is enhanced by his autograph.

M. STEPHAN has been elected a Corresponding Member in the Astronomical Section of the Paris Academy, in place of the late Dr. Hansen, of Gotha.

WE have received one or two letters on the subject of migration of birds, referred to in Col. Donnelly's letter in NATURE, vol. xix. p. 289. Mr. H. Cecil thinks that the most hopeful way of carrying out Col. Donnelly's proposal would be through our consuls. "If a tabular sheet, noting in separate columns the points to observe—drawn up, say, by Mr. A. R. Wallace—were printed on thin paper and transmitted to our consuls abroad, with a request that they would fill them up and remit them to NATURE, my impression is that few would decline. In cases where the consul himself had not the inclination or the time accurately to fill in the paper, he could generally command the services of some one who could. This need in no way interfere with the independent notes of which your correspondent speaks." Mr. Cecil thinks that any funds required could easily be got by subscription. Mr. Allen Harker, of Gloucester, thinks that a student of migration has rather an *embarras de richesse* to contend with than a want of data. "The researches of Middendorf," he writes, "or the admirable work of Dr. Palmen, 'Om foglarnes flyttningsväger,' reviewed in NATURE, vol. xv. p. 465, would furnish your correspondent with much of the information he desires, not to mention the many published observations of our own ornithologists, which are as reliable as they are voluminous." What is mainly wanted is, he thinks, not so much new records as a tabulation and systematic arrangement of those we already have. Mr. Harker refers to a comprehensive article on "The Migration of Birds," by Lieut.-Col. Drummond Hay, in the *Scottish Naturalist* of last year, which meets in some measure Col. Donnelly's suggestions.

GENERAL MYER has presented M. W. de Fonvielle with an improved weather-indicator in acknowledgment of the services rendered by him during the exhibition in popularising the principles adopted by the U.S. Signal Office. This weather indicator will be exposed in the shop of M. Secretan, the optician of Pont Neuf, and forecasts daily published according to the method adopted by the Signal Office in the several American farmers' post offices.

THE services rendered to meteorology by the observatories of Puy de Dôme and Pic du Midi are so great that it is proposed to establish two others, as we mentioned in our last impression, one on the top of Mont Ventoux, in the south of France, and the other on the top of Ballon de Servance (altitude 1,189 metres) in the department of Vosges. A fort and an electric telegraph having been established recently on the top of that mountain, the expenses will be very small. Two other mountains in the vicinity reach a somewhat higher altitude, but they are on the new frontier, and only a part of them belongs to France. M. Jules Ferry, the new Minister of Public Works, having been born in the Vosges, and being a representative of that department, it is pretty certain he will exhibit the same zeal for this enterprise as M. Bardoux, his predecessor, did for the Puy de Dôme Observatory.

TWO companies are in competition for exhibiting the monster Giffard's captive balloon. One directed by M. Tissandier contemplates continuing the ascents on the site of Cour des Tuileries, but there is some uncertainty whether the old palace will not be restored next summer. A German company offers to establish it at Berlin, on the occasion of the forthcoming International Exhibition.

MDME. SARAH BERNHARD, the celebrated actress, has published a volume on her captive balloon ascents.

IN his last report on the trade and commerce of New Caledonia, Mr. Consul Layard states that he has observed there a great variety of apparently valuable fibres, woods, and oils, which have yet to be developed. He also notes the discovery of a large deposit of good guano on some islands in the prolongation of the reef at the northern end of the island. He considers this somewhat remarkable, as it might have been imagined that the rain which falls in these latitudes would deprive the deposits of much of their valuable constituents. The guano, however, is said to have been tested in Melbourne and Sydney, from which places large orders for its supply have been received.

IN his just-published trade-report H.M.'s Consul at Islay, Peru, mentions that some very rich lodes have been discovered at Caylloma, a district about thirty leagues to the north of where the railway passes at Pampa de Arriero, on the road from Arequipa to Puno. Several parties have surveyed them, and they are supposed to be equal in riches to the famous Caracoles mines in Chile, which created so much excitement a few years back. It has been found, however, that there will be great difficulty in extracting the metal from some of the lodes, which are apparently very rich in silver ore, owing to the damp nature of the ground and the consequent necessity for powerful machinery to draw the water from the mines.

AREQUIPA, Peru, was visited on the night of January 9 by the most severe shock of earthquake that has been felt there since that which destroyed the city on August 13, 1868. The present shock occurred shortly before midnight and caused general consternation. The people quickly left their houses, and rushed frantically through the streets, fearing a repetition of the shock. No other, however, followed at that time, but three days later a long and violent single shock of earthquake occurred also at midnight.

WE are glad to notice that the Ancient Monuments Bill has passed through Committee of the House of Commons, with some slight modifications. We trust that the further stages necessary before the Bill can become law will be got through successfully during the present session.

THE German papers, the *Times* Paris correspondent states, give the following account of an occurrence at Rappelsdorf, in the Erfurt district, which, though dated the 21st of last month, is not uninteresting if true:—"Yesterday, at 5.45 P.M., the water of the Todten Lake suddenly rose with a violent bubbling, flooding the surrounding land for nearly 500 metres, and as suddenly returning to its natural bed. One Rappelsdorf inhabitant will have it that he saw a bubbling pillar of water rise fifty feet out of the lake, and that it burst asunder and spread on every side. During the rise of the water subterranean noises were heard. All that is now to be seen is a deep, gaping rent in the earth, from which from time to time vapour rises. The whole land over which the water spread is covered with innumerable small shells and dead fishes."

FURTHER experiments were made last Thursday in lighting the British Museum reading-room with the electric light. The result showed that by proper arrangement and at a comparatively moderate cost, there is good reason to believe that the end desired can be obtained. The Paris Société Générale d'Électricité have made the experiments at their own cost.

WE learn from the *Colonies and India* that experiments are still being carried on at the Peradeniya Botanic Gardens, Ceylon, with the view of discovering a cure for the leaf-disease in the coffee-tree. Mr. George Wall has devised an ingenious method of applying sulphur fumes to the trees for this purpose. A paper umbrella with a curtain hanging from it, is dropped over the tree, and fastened by the handle, a lighted sulphur fuse is then placed underneath, and it is said that the fumes are retained long enough to attack the spores of the fungus.

AN interesting account, *The Colonies and India* states, has been published in the papers of Barker's Cave, Rosella Plains, North Kennedy district, Queensland, to which place Sub-Inspector Armit had followed the track of a white woman and four black fellows. The tracks were followed for nearly three-quarters of a mile in the cave and then out again. The opening is about 25 feet high and 40 broad, and the average height 40 feet, with a breadth of 60 or 70. For about 180 yards from the mouth some degree of daylight is visible, but after that there is impenetrable darkness. The floor was almost perfectly level for hundreds of yards. A root of ficus was found growing 800 yards from the mouth of the cavern. Some hundreds of yards further on they came to water, and found that no further progress could be made without a canoe. An expedition, provided with a canoe and tools and other implements, is to be sent to make a thorough examination of the cave.

THE competition of Japan teas with those of China and Assam have quite recently received a new impetus. In a recent report on the tea trade of Hiôgo we are told that efforts are being made to stimulate this important native industry by the manufacture of black tea; this it is stated is of the greatest importance to Japan in view of the strong competition that exists between teas produced in the country and those known in trade as Formosa Oolongs, the only great market for both of these kinds being

America, the effect of which has been to reduce prices and consequently to impose a limit upon production. Several hundred piculs of imitation Congou were shipped to London from Hiôgo in the course of last year, and are said to have been favourably received in the market, both quality and flavour being of a high order; the only question remaining to be solved as to the success of these teas is whether they "can be produced at prices low enough to enable them to compete favourably in foreign markets with China and Assam teas."

IN the December part of the *Transunti* of the Royal Academy *dei Lincei* of Rome, Prof. Cossa gives an interesting account of his researches on the occurrence of the three metals cerium, didymium, and lanthanum. It appears that although these metals occur always in but minute quantities, yet their occurrence is far more frequent than is generally supposed, Prof. Cossa having been able to trace them even in bones and in the ashes of plants, not to speak of a number of minerals, such as certain apatites, Carrara marble, scheelite, &c. In Carrara marble Prof. Cossa found about two centigrammes of the mixed oxalates of cerium, lanthanum, and didymium in every kilogramme of marble; there were also traces of yttrium.

WE have on our table the following works:—"The Elements of Dynamics," second edition, James Blackie (Thin, Edinburgh); "Simple Lessons in Domestic Economy," Wm. Wyley Murly; "Education as a Science," A. Bain (Kegan Paul and Co.); "The Land of Midian," 2 vols., Capt. Burton (Kegan Paul and Co.); "Reise aus den Stillen Ozean," Max Buchner (J. N. Kerns); "The Study of Rocks," Text-Books of Science, Frank Rutley (Longmans); "Dictionary of Chemistry," vol. viii. part 1, Henry Watts (Longmans); "Report of the Recorder of the Botanical Locality Record Club," West (Newman and Co.); "British Burma and its People," Capt. Forbes (Murray); "Life in Asiatic Turkey," E. J. Davis (Stanford); "Geological Survey of Victoria, Report of Progress of the Secretary of Mines" (Trübner); "The Two Voyages of the *Pandora* in 1875 and 1876," Sir Allen Young (Stanford); "Practical Geology," W. J. Harrison (W. Stewart and Co.); "Animal Physiology," Dr. A. Wilson (W. and R. Chambers); "Manual of Practical Chemistry," A. W. Blyth (Chas. Griffin and Co.); "A Ministry of Health," B. W. Richardson (Chatto and Windus); "Morphology of Vertebrate Animals," A. Macalister (Longmans and Co.); "The Colour Sense," Grant Allen (Trübner); "Fuel, its Combustion and Economy," T. Symes Prideaux (Lockwood); "The Evolution of Man," 2 vols., Ernst Haeckel (Kegan Paul and Co.); "Experimental Culture of the Opium Poppy," John Scott (Calcutta Press); "Manual of Opium Husbandry," John Scott (Calcutta Press); "Sewage Poisoning," Edward T. Blake (Hardwicke and Bogue).

THE additions to the Zoological Society's Gardens during the past week include a Common Hare (*Lepus europæus*), British Isles, presented by Mrs. F. Buckland; an Impeyan Pheasant (*Lophophorus impeyanus*) from the Himalayas, two Cheer Pheasants (*Phasianus wallichii*) from North India, received in exchange; a Nuthatch (*Sitta cæsia*), British Isles, purchased; a Sambur Deer (*Cervus aristotelis*), born in the Gardens.

THE PHYSICAL NATURE OF THE SUN[1]

THE question whether all points of the sun are alike, in reference to the emission of light and heat, is not yet decided. As to the distribution of heat on the sun, many investigations have already been made with a view to answering this important question. Nervander seems to have been the first to discover (from temperature observations at Paris and Innsbruck) a temperature inequality of about ½° R, which has moreover the period of the sun's rotation (27·25 days). Simultaneously, Dr. Buys Ballot made a similar inquiry in Utrecht. Proceeding on the supposition that a kind of heat pole exists in the sun, and that accordingly the rotation of the sun must appear from long series of temperature determinations, he got from observations of temperature at Harlem, Zwanenburg, and Danzig, a period of 27·682 days. Since this result differs so much from that of Nervander, Buys Ballot subjected the calculations of Nervander to a thorough scrutiny, from which he concluded that that observer had "not only taken the moon for the sun, but had also mistaken the former." In his memoir Buys Ballot further showed, that to the colder side of the sun, which was presented to us on 1st January, 1846, a temperature corresponded that was, on an average, about 0·7° lower than that of the warmer side, which was presented to us on 15th January of that year. Carlini and D'Arrest got nearly the same result as Nervander. Airy, on the other hand, was unable to decide from the Greenwich observations. Since by the distinguished researches of Hornstein, Director of the observatory at Prague, and of Broun, it has been proved that the time of the sun's rotation may be deduced from variations of magnetic and barometric phenomena more accurately and from a short series (one year) of observations, and since both the period of Nervander and that of Ballot differ so much from Spoerer's and Carrington's rotation period, I submitted the Prague temperature-observations for 1876 to a closer examination, expecting a much shorter period from these than Hornstein got from magnetic and barometric observations, as I supposed that it would correspond to the rotation, deduced from spot observations, of the thermal equator of the sun, which, it is known, does not coincide with the true equator. I worked the observations therefore by the method given by Hornstein in the *Sitzungsberichte* of the Vienna Academy (Bd. 67), as it is peculiarly suited for such researches. I here communicate the final result. The most probable value obtained for T was 25·56 days. According to Carrington's observations, the position of the thermal equator of the sun on the foregoing supposition would have the latitude 10° to 20°, according to Spoerer's observations, the latitude 13° to 40°. As recent researches seem to show that the influence of variation of the forces of the sun is reflected in the variations of meteorological phenomena, I further investigated the wind components of the year 1870, in their relation to the rotation-time of the sun. For the east-west-components I found a period of 26·71 days. Whether from this result may be concluded a correspondence between prevalent winds in the sun, such as Spoerer has deduced from his spot-observations, will have to be decided by closer investigation.

THE STRUCTURE AND ORIGIN OF LIMESTONES[1]

AFTER the obituary notices of eminent Fellows lost during the past year, who were more than usually numerous, the president confined his own special address to the consideration of the structure and origin of limestones, relying mainly on his own observations, but incorporating general facts derived from other sources. Since, in order to properly understand the nature of the various constituent fragments of which many limestones are composed, it is necessary to know the organic and mineral constitution of the various different living calcareous organisms, this question was first considered from a somewhat novel point of view, and they were regarded, not merely as living tissues, but also as mineralised organisms, much attention being paid to their special optical characters. Much attention had been also paid to their true mineral constitution, so as to ascertain in which groups the carbonate of lime exists in the form of calcite, and in which as aragonite. The results are in some cases remarkable, even in relation to biology, and are of great interest and importance in the study of limestone rocks and their included fossils, since subsequent changes depend mainly on whether the original material was calcite or aragonite. This is due to the fact that calcite is in a state of stable equilibrium, and cannot be changed to aragonite, whereas aragonite is relatively in a state of unstable equilibrium, can be changed to calcite, and usually has so changed in limestone rocks. This circumstance has given rise to a complete difference in the state of preservation of many fossils. When they were originally calcite, they may have been further consolidated, but retain their original structure and optical properties, whereas when they

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[1] By Dr. Gruss, in the *Astronomische Nachrichten*.

[1] Abstract of Anniversary Address to the Geological Society by Mr. H. C. Sorby, F.R.S., President, communicated by the author.